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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/977,214	10/16/2001	Kenji Nakai	110753	3585

25944 7590 01/27/2004

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EXAMINER

MERCADO, JULIAN A

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 01/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/977,214

Applicant(s)

NAKAI ET AL.

Examiner

Julian Mercado

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6/20/02
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____

DETAILED ACTION

Remarks

This Office action is a first action on the merits of the present application.

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishizuka et al. (U.S. Pat. 6,019,802) in view of Toshio et al. (JP 10-241685) and Ein-Eli et al. (U.S. Pat. 5,962,166).

Claims 11-14 and 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakai et al. (U.S. Pat. 5,962,167) in view of Toshio et al. (JP 10-241685) and Ein-Eli et al. (U.S. Pat. 5,962,166).

The rejections based on either Ishizuka et al. or Nakai et al. as primary reference teachings will be discussed in parallel.

Regarding independent claim 1, Ishizuka et al. teaches a non-aqueous electrolytic solution secondary battery having an electrode group comprised of a positive electrode

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[5], a negative electrode [4] and a separator [3], “[p]ositive electrode terminal 8 was previously connected to positive electrode sheet 5, and battery case 2 was previously connected to negative electrode sheet 4 with a leading terminal”. (Figure 1, col. 28 line 8-11) A safety valve serves as an internal pressure releasing mechanism. (col. 17 line 51) The positive electrode includes a lithium manganese complex oxide such as lithium manganate or LiMnO_2 applied on both sides of an aluminum foil current collector, with the negative electrode also applied on both sides of a foil current collector with the addition of a carbon material such as graphite. (col. 27 line 4-8, also applies to dependent claims 3, 4)

Regarding independent claim 11, Nakai et al. teaches a non-aqueous electrolytic solution secondary battery having an electrode group comprised of a positive electrode [8], a negative electrode [6], separator [3], connecting portions [11, 12] to connect to the electrode groups and an internal pressure releasing mechanism such as a notch in plate [13]. (col. 5 line 48-56, Example 1 starting from col. 5 line 66, Figure 1) The positive electrode of a lithium manganese complex oxide of the formula Li_xMnO_4 and the negative electrode including amorphous carbon are both formed on both sides of respective foil current collectors. (col. 6 line 17-40, also applies to dependent claim 13, 14)

Ishizuka et al. nor Nakai et al. does not explicitly teach an amount of manganese elution to be 5% or less (independent claims 1, 11) or 3.2% or less (dependent claim 3, 13) However, Toshio teaches a non-aqueous electrolytic solution secondary battery in which manganese elution does not occur. (Abstract, par. [0004]) By Toshio’s disclosure of manganese elution not occurring, it is reasonably interpreted as a near-zero manganese

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elution. Thus, the skilled artisan would find obvious to modify Ishizuka et al.'s invention or Nakai et al.'s invention so that manganese elution does not occur, for reasons such as prevention of cell internal impedance increase and the resulting capacity drop. (*ib*)

Ishizuka et al. nor Nakai et al. does not explicitly teach an electrode potential to metal lithium of 4.8V or more. However, Ein-Eli et al. teaches an electrode potential which is at the ultrahigh level of 4.7 to 5.1 V. (col. 2 line 33-49) Ein-Eli et al. achieves the ultrahigh voltage via a Cu-modified spinel in which the amount of copper substituted into the spinel structure of the LiMnO_2 results in a concomitant decrease in the amount of Mn within the formula $\text{LiCu}_x\text{Mn}_{2-x}\text{O}_4$. (see Table I, also applies to dependent claims 7, 8, 10, 17, 18, 20). In the examples wherein $x = 0.2$ or 0.3 , the ratio of Li/Mn would resultantly be 5.6 and 5.9 which comfortably fall within the claimed range of 0.55 to 0.60. (applies to dependent claims 2, 6, 12, 16) The skilled artisan would find obvious to modify Ishizuka et al.'s invention or Nakai et al.'s invention so that the electrode potential is 4.8V or more by employing Ein-Eli et al.'s Cu-modified spinel, in order to obtain a battery that serves as a long-lived rechargeable power source, i.e. in order to achieve a high capacity battery. (col. 4 line 22-35)

Regarding dependent claims 5 and 15, as to a half band width change of main diffraction light between SOC 0% and SOC 100% being 25% or less, as the lithium secondary battery is identical to that disclosed and claimed by applicant for the reasons discussed under the 35 U.S.C. 103(a) rejections above, it would naturally flow to inherently have the same half band width change within the range as claimed, absent of a showing by applicant that the claimed invention distinguishes over the reference. *In re*

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Best, 195 USPQ at 433, footnote 4 (CCPA 1977) and *In re Spada*, 15 USPQ 2d 1655 (Fed. Cir. 1990)

Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Michiko et al. (JP 2001-015173) in view of either Ishizuka et al. or Nakai et al., and Toshio et al. and Ein-Eli et al.

At the outset, as a translation of the foreign priority papers has not been made of record in accordance with 37 CFR 1.55, this ground of rejection limits applicant's filing benefit based on the 2000-368725 priority document filed December 4, 2000. This ground of rejection is set forth to the extent that the presently claimed invention may be wholly contained in the later-filed 2001-030357 foreign priority document.

Regarding independent claims 1 and 11, Michiko et al. teaches a non-aqueous electrolytic solution secondary battery having an electrode group comprised of a positive electrode, a negative electrode, separator, and connecting portions such as terminals to connect to the electrode groups. (pars. [0046-0047]) The positive electrode of a lithium manganese complex oxide of the formula LiMn_2O_4 and the negative electrode including amorphous carbon are both formed on both sides of respective foil current collectors. (pars. [0035, 0044, 0045], also applies to dependent claim 13, 14) While referred to by Michiko et al. as "amorphous" carbon (as applicable to independent claim 11), as to graphite in the negative electrode (independent claim 1 and dependent claim 3), Michiko et al. teaches that the extent of crystallinity or amorphous structure of carbon is effectively present in inversely proportional degrees which are desirably controlled within two Lc endpoints as determined by their X-ray diffraction patterns. (par. [0023])

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A low Lc indicates a high amorphous structure while a high Lc indicates a high graphitic structure. A low Lc results in a decline in lithium intercalation rate while a high Lc results in unidirectional intercalation, both detrimental effects resulting in the cell's output being reduced. (par. [0025]) Thus, the carbon material in Michiko et al. is considered to be, at least to some measurable degree, *both* graphitic and amorphous, as Michiko et al. specifically recites that for the amorphous carbon material the "carbonaceous crystal thickness Lc is one of the indexes showing carbonaceous crystallinity". (*ib*) The ratio of Li/Mn is controlled within the range of 0.55 to 0.8 (Abstract), while a specific example employs a ratio of 0.58 (par. [0035]) which is within the claimed range of 0.55 to 0.60. (applies to dependent claims 2, 6, 12, 16)

Michiko et al. does not explicitly teach an internal pressure releasing mechanism. However, as discussed above Ishizuka et al. teaches a safety valve as an internal pressure releasing mechanism (col. 17 line 51), while Nakai et al. similarly teaches an internal pressure releasing mechanism such as a frangible notch in the battery container. (col. 5 line 48-56) Thus, the skilled artisan would find obvious to employ an internal pressure releasing mechanism in Michiko et al.'s invention in view of either Ishizuka et al. or Nakai et al. for reasons such as prevention of battery explosion due to pressure buildup.

As to an amount of manganese elution to be 5% or less (independent claims 1, 11) or 3.2% or less (dependent claim 3, 13), as discussed above Toshio teaches a non-aqueous electrolytic solution secondary battery in which manganese elution does not occur, i.e. effectively present at near-zero amounts. (Abstract, par. [0004]) The skilled artisan would find obvious to modify Michiko et al.'s invention so that manganese

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elution does not occur for reasons such as prevention of cell internal impedance increase and the resulting capacity drop. (*ib*)

As to an electrode potential to metal lithium of 4.8V or more, as discussed above Ein-Eli et al. teaches an electrode potential which is at the ultrahigh level of 4.7 to 5.1 V. (col. 2 line 33-49) Ein-Eli et al.'s use of a Cu-modified spinel of LiMnO_2 resulting in $\text{LiCu}_x\text{Mn}_{2-x}\text{O}_4$ is deemed consistent with Michiko et al.'s disclosure that other transition metals may be substituted into the lithium manganate active material. (par. [0012], also applies to dependent claims 7, 8, 10, 17, 18, 20). Thus, the skilled artisan would find obvious to modify Michiko et al.'s invention so that the electrode potential is 4.8V or more by including Cu, *inter alia*, into the spinel structure of the lithium manganate active material in order to obtain a high capacity battery that serves as a long-lived rechargeable power source. (*ib*)

Regarding dependent claims 5 and 15, as to a half band width change of main diffraction light between SOC 0% and SOC 100% being 25% or less, as discussed above since the lithium secondary battery is, *prima facie*, identical to that disclosed and claimed by applicant for the reasons discussed under the 35 U.S.C. 103(a) rejections above it would naturally flow to inherently have the same half band width change within the range as claimed, absent of a showing by applicant that the claimed invention distinguishes over the reference. *In re Best*, 195 USPQ at 433, footnote 4 (CCPA 1977) and *In re Spada*, 15 USPQ 2d 1655 (Fed. Cir. 1990)

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Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Commonly-owned U.S. Patent 6,506,518 B1 is cited to teach a Li/Mn ratio of 0.55 to 0.6.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Julian Mercado whose telephone number is (571) 272-1289. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan, can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.



Julian Mercado



Patrick J. Ryan
Supervisory Patent Examiner